

Remarks

Claims 63 and 66-69 have been cancelled. Claims 55, 58, and 60 have been amended, and new claim 70 has been added. New claim 70 does not constitute new matter as it is supported at, for example, Figure 1 and pages 4 and 5 of the originally filed specification.

Claims 66-69 have been withdrawn from consideration as being directed to a non-elected invention. Applicant has herein cancelled claims 66-69.

Claims 55-59 have been rejected in one instance as failing to comply with the written description requirement, specifically 35 U.S.C. 112, first paragraph. As Applicant understands the rejection, the Examiner believes that the specification fails to make mention of forming "the second conductive material physically against the first conductive material without an insulative composition between the first and second conductive materials".

The exact terms of the specification need not be used to satisfy the written description requirement of the first paragraph of 35 U.S.C. 112. *Eiselstein v. Frank*, 52 F.3d 1035, 1038, 34 USPQ.2d 1467, 1470 (Fed. Cir. 1995); *In re Wertheim*, 541 F.2d 257, 265, 191 USPQ 90, 98 (CCPA 1976). See also 37 CFR 1.121(e) which merely requires substantial correspondence between the language of the claims and the language of the specification. MPEP § 1302.01. Mere rephrasing of a passage does not constitute new matter. Accordingly, the rewording of a passage where the same meaning remains intact is permissible. *In re Anderson*, 471 F.2d 1237, 176 USPQ 331 (CCPA 1973). The mere inclusion of dictionary or art recognized definitions known at the time of filing an application should not be considered new matter. See, e.g., *Schering Corp. v. Amgen, Inc.*, 222 F.3d

1347, 1352-53, 55 USPQ.2d 1650, 1654 (Fed. Cir. 2000). MPEP § 2163.07(I).

Claim 55 recites a method of forming a conductive material that includes, in pertinent part, exposing the precursor to a reducing atmosphere to release the metal from the precursor to form the second conductive material physically against the first conductive material without an insulative composition between the first and second conductive materials. This is fully supported by the specification at the bottom of page 5 and continuing on to page 6 which is reduced herein below.

Prior art methodologies have existed wherein a metal-containing mass is formed over a layer identical to the above-described layer 22 by exposing a metallo-organic material to oxidizing conditions. However, a problem with such prior art processes is that the oxidizing conditions can oxidize various components of layer 22 to reduce the conductivity of such layer. For instance, if layer 22 comprises titanium, tantalum or tungsten, the exposure of such layer to oxidizing conditions can form oxides of titanium, tungsten or tantalum. Such oxides are electrically insulative, and accordingly the desired conductive characteristics of layer 22 are compromised, or in some cases even entirely lost, which can render devices subsequently formed from layer 22 to be inoperable. In contrast, the utilization of reducing conditions in embodiments of the present invention can avoid oxidation of the materials of layer 22, and accordingly maintain the desired conductive characteristics of layer 22 during formation of mass 24. A further advantage of utilizing reducing conditions in methodology of the present invention is that many metallo-organic precursor materials contain oxygen, which can be released during chemical degradation of the precursor materials. The released oxygen can oxidize substrate materials. However, utilization of a reducing atmosphere can essentially scavenge the oxygen before it deleteriously reacts with a substrate material. For instance, in particular embodiments of the present invention, NH_3 can be utilized to essentially scavenge oxygen.

For at least the reason that the specification recites not forming oxides of titanium, tungsten, and tantalum; and oxides of titanium, tungsten, and tantalum are insulative compositions to those of ordinary skill in the semiconductor art; the specification supports not forming an insulative composition. As such, claim 55 and all claims depending from claim 55 are supported by the specification as filed. Applicant respectfully requests that

this 35 U.S.C. 112 first paragraph rejection be withdrawn.

Claims 55-59 have also been rejected either as anticipated by US Patent 5,130,172 to Hicks (Hicks) or obvious in view of U.S. Patent 6,074,945 to Vaartstra ('945) in view of U.S. Patent 6,197,628 to Vaartstra ('628). In order to anticipate a claim the prior art reference must teach each and every element of the claim with the same detail as recited in the claim. With respect to the obviousness rejections, the Examiner is respectfully referred to MPEP § 2122, which recites, in part, to establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference, or references when combined, must teach or suggest all the claim limitations. The teaching or suggestions to make the claim combination and the reasonable expectation of success must both be found in the prior art and not based on Applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ.2d 1438, 1442 (Fed. Cir. 1991).

Claim 55 has been amended and as amended recites a method of forming conductive material that includes providing a semiconductor substrate and forming a first conductive material over the substrate with the first conductive material including one or more of TiN, WN, TaN, elemental Ta, and elemental Ti. Claim 55 further recites depositing a second conductive material physically against the first conductive material, with the second conductive material consisting essentially of a metal and being different than the first conductive material. Claim 55 also recites that the depositing the second conductive material includes providing a metallo-organic precursor proximate the first conductive

material, with the metallo-organic precursor comprising metal and carbon, and exposing the precursor to a reducing atmosphere to release the metal from the precursor to form the second conductive material physically against the first conductive material without an insulative composition between the first and second conductive materials. Claim 55 is allowable in view of the Hicks reference for at least the reason that Hicks does not teach or suggest all of the elements of claim 55.

For example, the Hicks reference describes methods for depositing metal on substrates containing, for example, tungsten and silicon (see Hicks abstract). More specifically, with reference to column 6 and lines 25-35, Hicks specifically teaches depositing platinum on a substrate of silicon, tungsten and silicon oxide. Applicant can find no reference in Hicks to depositing a conductive material physically against a first conductive material with a first conductive material comprising one or more of TiN, WN, TaN, elemental Ta, or elemental Ti. For at least the reason that Hicks does not teach or suggest all the elements of claim 55, Hicks cannot anticipate claim 55 and claim 55 is therefore allowable in view of Hicks.

As recited above, claims 55-59 have been rejected as obvious in view of both Vaartstra references ('945 and '628). Applicant notes that the Federal Circuit has determined that the "problem confronted by the inventor must be considered in determining whether it would have been obvious to combine references in order to solve the problem". *Diversitech Corp. v. Century Steps Inc.*, 7 USPQ.2d 1315, 1318 (Fed. Cir. 1988). If the references do not address or even recognize the problem they cannot begin to teach or suggest the solution to it. The Federal Circuit further stated that "the nature of the problem 'which persisted in the art,' and the inventor's solution, are factors to be considered in

determining whether the invention would have been obvious to a person of skill in that art.” *Northern Telecom v. Datapoint Corp.*, 15 USPQ.2d 1321, 1324 (Fed. Cir. 1990). In *Northern Telecom*, the Federal Circuit confirmed a finding that the claims were valid in view of prior art that did not “suggest the [inventors’] solution” to a problem. *Id.* at 1323-24. In view of the foregoing Federal Circuit case law it should be noted that none of the cited references and, in particular, neither of the Vaartstra references teach or suggest the problem of oxidation and carbon build up as described in the specification on pages 5 and 6. As such, the references themselves do not recognize at least one of the problems the claimed invention solves.

As the cited references do not recognize at least one of the problems the claimed invention solves, understandably, there is no suggestion or motivation to combine the references nor do the references teach or suggest all the elements of claim 55. For example, referring to column 6, lines 5-15, of the ‘945 reference, barrier layers are described. However, as the Examiner has acknowledged, Vaartstra ‘945 does not teach or suggest a second conductive material physically against a first conductive material without an insulative composition between the first and second conductive materials. There is no suggestion or motivation to combine Vaartstra ‘945 with Vaartstra ‘628 to meet this limitation nor does Vaartstra ‘628 meet this limitation to the extent it can be combined.

The Examiner has cited Figure 6 of Vaartstra ‘628 as teaching the limitation of a first conductive material without an insulative composition between first and second conductive materials. Applicant respectfully disagrees. Figure 6 does not teach or suggest a first material that comprises one or more of TiN, WN, TaN, elemental Ta, and elemental Ti as recited in claim 55. Figure 6 only teaches a first material comprising silicon. Therefore the

combination of the Vaartstra references does not teach or suggest all of the elements of claim 55. For at least this reason claim 55 is allowable in view of both of the Vaartstra references.

Furthermore, Vaartstra '628 teaches away from combination with Vaartstra '945, as Vaartstra '628 specifically teaches the utilization of an inert carrier gas to deposit the precursor (column 5, lines 65-67 and column 6, lines 1-4), while Vaartstra '945 recites the use of reducing gases that are reactive (column 3, lines 43-45).

For at least the reasons the cited references do not teach or suggest all the elements and/or cannot be properly combined to teach or suggest all the elements of claim 55, claim 55 is allowable in view of the cited references.

Claims 56-59 and 70 depend from claim 55 and are allowable for at least for the reasons cited above regarding claim 55.

Claim 60 has been rejected as anticipated by the Hicks reference mentioned above. Claim 60 has been amended, and as amended recites a method of forming a conductive material that includes providing a semiconductor substrate having a tungsten-comprising layer thereover. Claim 60 further recites exposing one or more metallo-organic precursors to a reducing atmosphere to release metal from at least one of said precursors, with the one or more precursors comprising one or more of ruthenium, rhodium, iridium, cobalt, palladium, and nickel. Claim 60 also recites depositing released metal over the tungsten-comprising layer to form a conductive material on the tungsten-comprising layer. Referring again to Hicks, Hicks describes the deposition of the organo-metallic compound onto a substrate (column 3, lines 20-29). Hicks then goes on to describe (column 6, lines 23-45) the specific deposition of platinum on a substrate of silicon, tungsten and/or silicon

oxide. While Hicks mentions a myriad of other metals for deposition, it only describes the deposition of platinum on tungsten. Hicks fails to teach or suggest the exposing one or more metal precursors comprising one or more of ruthenium, rhodium, iridium, cobalt, palladium, and nickel to a reducing atmosphere to release metal from at least one of the precursors and depositing the released metal over a tungsten-comprising layer. For at least the reason that claim 60 recites limitations not taught or suggested by Hicks, claim 60 is allowable in view of Hicks.

Claims 61-62 and 64-65 depend from claim 60 and are allowable for at least the reasons stated above regarding claim 60.

This application is now believed to be in immediate condition for allowance, and action to that end is respectfully requested. If the Examiner's next anticipated action is to be anything other than a Notice of Allowance, the undersigned respectfully requests a telephone interview prior to issuance of any such subsequent action.

Respectfully submitted,

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By: _____

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